7. $\int_1^{e^2} \frac{x^3+1}{x}\,dx$

$\int_1^{e^2} x^2 + \frac{1}{x}\,dx =$

$\frac{x^3}{3} + \ln x \Big|_1^{e^2} = \frac{e^6}{3} + 2 - \frac{1}{3}$

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6. $x^3 + 2x^2y - 4y = 7$ $\quad x = 1$

$1 + 2y - 4y = 7$ $\quad \frac{dy}{dx} = ?$

$3x^2 + 2x^2 \cdot \frac{dy}{dx} + y \cdot 4x - 4\frac{dy}{dx} = 0$

$2x^2\frac{dy}{dx} - 4\frac{dy}{dx} = -3x^2 - 4xy$

$\frac{dy}{dx}(\cancel{2x^2-4}) = \frac{-3x^2-4xy}{2x^2-4}\Big|_{(1,-3)} = \frac{9}{-2}$

Mar 8-8:04 AM

8.

$f(x) < 0$ all x

$g(5) = 2$

$h(x) = \frac{f(x)}{g(x)}$ $\quad h'(x) = \frac{g(x)f'(x) - f(x)g'(x)}{(g(x))^2}$

$h'(x) = \frac{f'(x)}{g(x)} (g(x))^2 = \frac{g(x)f'(x) - f(x)g'(x)}{\cancel{(g(x))^2}} (g(x))$

solve for $g(x)$

$\cancel{f'(x)g(x)} = \cancel{g(x)f'(x)} - f(x)g'(x)$

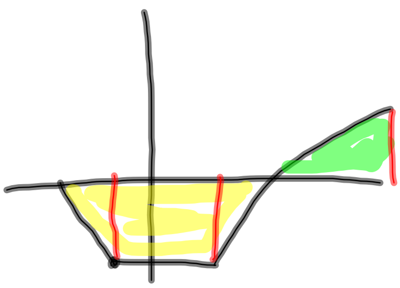
$0 = -f(x)g'(x)$

$g'(x) = 0$

$g(x) = c = 2$

Mar 8-8:09 AM

2. $-3 \le x \le 5$



$$\int_{-3}^{5} f(x)\,dx$$

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review 4

Polar, Parametric, vectors

parametric $x = f(t)$
$y = g(t)$

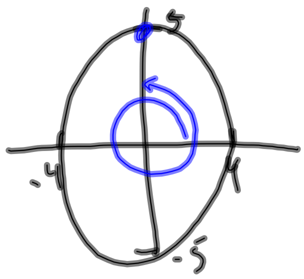
$x = 4\cos(\pi t)$
$y = 5\sin(\pi t)$

period $= \frac{2\pi}{\pi}$

find the position at $t = 2.5$

$x = 4\cos(\pi \frac{5}{2}) = 0$

$y = 5\sin(\pi \cdot \frac{5}{2}) = 5$



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polar

$r = f(\theta)$

$x = r\cos\theta$

$y = r\sin\theta$

$r = \sqrt{x^2 + y^2}$

$\theta = \tan^{-1} \frac{y}{x}$ if in QI, QIV

add π in QII, QIII

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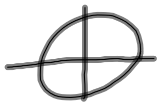
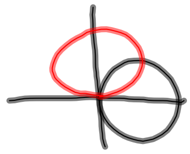
$r=1$



$r=\cos\theta$

$r=\sin\theta$



$r=a\cos(n\theta)$ n-leafed rose

$r=a\sin(n\theta)$

n even: 2n leaves

n odd: n leaves (period $=\pi$)

$r=a+b\cos\theta$

$r=a+b\sin\theta$

$a=b$ cardioid

$a<b$ limacon with a loop

$a>b$ limacon with a dimple

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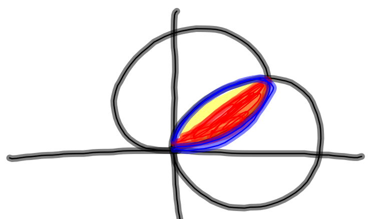
$r=2\cos\theta$

$r=2\sin\theta$

find the points of intersection



$2\cos\theta=2\sin\theta$

$\cos\theta=\sin\theta$

$\theta=\frac{\pi}{4}$ $\quad \cancel{\theta=0}$ $\quad 2\cdot\int_0^{\pi/4}\frac{1}{2}(2\sin\theta)^2\,d\theta$

Mar 8-8:42 AM